

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

Dam, Multiple-Purpose

(Number and Acre-Feet)

Code 349

DEFINITION

A dam constructed across a stream or a natural watercourse that has a designed reservoir storage capacity for two or more purposes, such as floodwater retardation and irrigation water supply, municipal water supply, and recreation.

PURPOSES

A multiple-purpose dam must provide distinct and specific storage allocations for two or more of the following purposes: (1) floodwater retardation, (2) irrigation, (3) fishing, hunting, boating, swimming, or other recreational uses, (4) improve environment or habitat for fish or wildlife, (5) municipal, (6) industrial, and (7) other uses. A reservoir for which multiple use is made of the same storage allocation is not a multiple-purpose dam; however, a dam designed for joint-use storage is a multiple-purpose dam.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies only to sites meeting all the following criteria:

1. Topographic, geologic, hydrologic, and soil conditions at the proposed site are satisfactory for construction a feasible dam and reservoir.
2. The watershed is protected from erosion to the extent that the sediment yield will not

shorten the planned effective life of the reservoir.

3. Water is available from a single or combined source of surface runoff, base flow or from subsurface storage in sufficient quantity and adequate quality to satisfy the intended purposes.

CRITERIA

Foundation, embankment and spillway. All dams designed under this standard shall meet or exceed the foundation, embankment, and spillway criteria called for in NRCS standard for ponds (378) or in TR-60, as appropriate.

Floodwater retarding pool and spillway. Dams having a floodwater retarding purpose shall meet or exceed the requirements of NRCS standard for floodwater retarding dams, Standards and Specifications 402.

Outlet works. Outlet works discharging releases for several purposes shall have adequate capacity to carry the peak flow resulting from the combined demands at any time. Outlet conduits and appurtenances shall be designed according to criteria that are equal to or better than that called for in NRCS standard for ponds, (378) or in TR-60, as appropriate.

Storage. The usable storage capacity shall be adequate for all purposes. Seasonal variations in demand and the expected losses from seepage and evaporation must be considered.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Sediment storage. The capacity, in addition to the required for all other purposes, must offset depletion by sediment accumulation for a period equal to the design life.

Type of structures. All dams and appurtenances shall be designed to meet applicable NRCS standards for the specific type and class of structure.

CONSIDERATIONS

A multiple-purpose dam should be part of the treatment needed to protect the soil, water, plant, animal and air resources. In addition, a conservation cropping system, conservation tillage, crop residue management or other appropriate system should be planned to control erosion above the impoundment area and protect the other resources. The management system must be planned to prevent excessive maintenance and operation problems.

Effects on water quantity and quality shall be considered. This practice will reduce downstream flow rates during periods of runoff. Overall surface water quantity may be reduced by evaporation from the water surface of the reservoir, increased seepage to the ground water and raising of the phreatic line in the vicinity of the pool. The infiltration volume will depend on the infiltration rates of the soils in the reservoir area and the length of time water remains.

The quantity of water may be reduced by the amount of water taken from the reservoir for such purposes as irrigation and municipal use. There may be return flows from these diversions, but their extent and location must be assessed on an individual basis. Peak flows immediately downstream of the structure may be reduced but the duration will be extended. Ground water quantity may be increased by the amount of infiltration through the reservoir sides and bottom that reaches the saturated zone.

Surface water quality may either remain the same or be improved where the multiple purpose dam is used as a floodwater retarding structure. The retention of floodwater may reduce the rate of flow and allow suspended sediments and bedload to remain in the pool area. If

downstream banks and channels are stabilized, the resulting water quality may be improved by reduction in sediment and sediment attached substances. If downstream bed and banks are not stabilized, the cleaner water from the reservoir may pick up a sediment load from the downstream channel. In addition, the longer periods of flow may cause increased bank saturation and result in slumps and other forms of bank instability, resulting in suspended sediments and bed loads. In either case, the resulting water quality should not be worse than before the structure is installed, except for the first few months or year immediately after construction.

Multiple-purpose dams resulting in reservoirs used for recreation may result in additional surface water degradation. Considerations should include increased use of pesticides for vector control; human wastes, either treated or untreated (increased bacteria, organic wastes, and nutrients); incidental pollutants such as fuels, oils, and other chemicals; and sediment from bank erosion.

The creation of a sediment pool behind the dam may increase the temperature of the water retained. In addition, deposited sediments may act as a sink for adsorbed nutrients and pesticides, improving surface water downstream. The positioning of the outlet structure will influence the dissolved oxygen level and temperature of the surface water downstream. As a general rule, the lower the outlet in regards to the water surface, the colder the water and the lower the dissolved oxygen concentration. Colder water has a higher ability to retain dissolved oxygen but at greater depths, colder water has lower dissolved oxygen.

Soluble nutrients, pesticides, and other chemicals may increase potential for ground waste contamination, which infiltrate through the reservoir sides and bottom. These may originate from chemicals used in the structure and reservoir area, or may be dissolved in waters from the watershed area. Ground water quality may be affected by human use as discussed previously for surface water quality.

Special attention shall be given to maintaining and improving visual resources and habitat for

fish and wildlife where applicable. The landowner/user will be advised if wetlands will be affected and USDA-NRCS wetland policy will apply. All work planned shall be in compliance with General Manual Title 450-GM, Part 405, Subpart A, Compliance with Federal, State, and Local Laws and Regulations. If archaeological or historical properties are encountered, the USDA-NRCS policy in General Manual Title 420-GM, Part 401 shall be followed.

PLANS AND SPECIFICATIONS

Plans and specifications for installing multiple-purpose dams shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Specifications for dams to which the standard for ponds (378) applies shall, as a minimum, be commensurate with those for ponds (378).

Specifications for dams to which the criteria in TR-60 apply shall be in accord with the guide specifications contained in the National Engineering Handbook, Section 20.

OPERATION AND MAINTENANCE

A maintenance program shall be established by the landowner/user to maintain capacity and vegetative cover. Items to consider are:

1. Do not graze protected area of embankment and impoundment area or provide well managed grazing.
2. Fertilize to maintain a vigorous vegetative cover in protected area. Caution should be used with fertilization to maintain water quality.
3. Mulch, spray or chop out undesirable vegetation periodically to prevent growth of large woody stemmed weeds, water plants such as cattails or trees (such as willows) from embankment and spillway areas. Caution should be used to use only chemicals approved for their use on the label.
4. Promptly repair eroded areas.
5. Promptly remove any burrowing rodents that may invade area of embankment.
6. Reestablish vegetative cover immediately where scour erosion has removed established seeding.
7. Keep open all spillways and remove trash that may accumulate around entrance.
8. Periodically inspect area for any new maintenance items and if any are observed take immediate action to protect from further damage or deterioration.

